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Central File

No. 0.73

6.291

7.12

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FOREST SURVEY RELEASE NO. 3

AN APRIL 1937 PROGRESS REPORT

THE INVENTORY PHASE OF THE FOREST SURVEY
NORTHERN ROCKY MOUNTAIN REGION

DEFINITION OF THE PROCEDURE,
TERMS, AND CLASSIFICATIONS



U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

NORTHERN ROCKY MOUNTAIN
FOREST AND RANGE EXPERIMENT STATION

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Foreword

Authorized by the McSweeney-McNary Forest Research Act of 1928, the Forest Survey of the United States was inaugurated to obtain essential information concerning the forest situation and forest needs of the nation. To the Northern Rocky Mountain Forest and Range Experiment Station has fallen that portion of the project covering the forested part of the Northern Rocky Mountain Region. Included in this region are: the three northeastern counties in Washington, Idaho north of the Salmon River, and Montana.

To facilitate the task of assembling and presenting the complex mass of information desired, the Forest Survey has been subdivided into five major phases:

1. Inventory Phase - a stock taking and land classification with special emphasis on the forest area, forest cover, and timber volume.
2. Growth Phase - the determination of the rate of growth and probable future yields in both old and young timber stands.
3. Depletion Phase - the determination of the rate of use of our forest resources by cutting, and the loss from fire, insects, and disease.
4. Requirements Phase - the determination of present national, regional, and local requirements for forest products, and probable trends in future requirements.

5. Report or Planning Phase - consisting of a detailed economic analysis and planning by the correlation of the collected data in the light of various social factors.

Containing a brief description of the procedure, and definitions of the types, terms, and classifications used in the inventory phase of the Forest Survey, this publication is intended as an explanatory supplement to the county statistical reports.

The Inventory Phase - Objectives and Procedure

As set up for the region, the objectives of the inventory phase are two-fold, contemplating first the preparation of detailed type maps, and second the compilation of area and timber volume statistics. For the portion of the region covered to date, two-inch-to-the-mile township maps are available showing the forest and nonforest types. The salient features of each forest type are shown on these maps; type of stand; the species represented; the average size of the dominant trees; the volume range;^{1/} the average age; the stand density or stocking; the producing quality of the land, termed the site index; and the cutting condition, that is, whether the area has been previously logged, and the nature of the residual stand following logging.

^{1/} Due to the confidential nature of the greater part of the timber volume data, the volumes in stands of merchantable size are presented on the maps by general classes only.

From the township maps more general unit maps have been made, which contain forty townships on a one-inch-to-the-mile scale. Copies of the township and unit maps are available at the cost of printing.

The statistical compilation represents a summarization of these area and volume data by township and county. The data are further classified according to type of ownership, (i.e., large private, small private, national forest, etc.) land use policy, and by broad classes according to the accessibility for conversion into timber products.

The mechanics of collecting the inventory is divided, roughly, into several general steps. First is the collection of available cruise and type data from the various public agencies, and likewise, with the promise of confidential use, the collection of commercial cruises from private concerns. With this working nucleus, the actual task of the field mappers is one of checking the reliability of and supplementing the collected cruises, and then filling in the blanks of the type picture. The mappers are required to make extensive cruises of the sawtimber stands not having commercial cruises, as well as to label in detail each of the numerous immature and other nonmerchantable types. Sawlog stands are mapped down to 40 acres and other forest lands down to 100 acres. Since forest stands are seldom homogeneous, the type symbol does not necessarily portray conditions on any particular portion of the area but rather average conditions for the entire acreage.

To obtain a comprehensive picture the nonforest types are mapped in some detail. The nonforest area is classified into the following groups; cultivated land, stump pasture, town sites, grassland, brush, and barrens.

Due to the roughness of the country, the mapping procedure does not follow any strictly mechanical method. As the boundaries of types in this region are usually quite closely defined by topography, the mappers generally are able to draw in the type lines for an area from various vantage points and course each type sufficiently to classify it. The intensity of coverage is dependent upon the nature of the type, a merchantable stand, for instance, ordinarily requiring closer examination than a young one.

The commercial cruises as collected are not entirely satisfactory for Survey use to the extent that they have been based on many and varied standards depending upon the purpose of the cruise, the manner of utilization intended, and natural differences between individual cruisers. To circumvent this difficulty approximately one-tenth of the sawlog area of each large land holder, excepting the Forest Service, is checked with a 10 percent cruise by experienced cruisers to determine the correction factors to be applied in raising or lowering these cruises to the Forest Survey standards. By reason of the low merchantable limit set by the Survey and because an attempt is being made to get all of the volume in trees of sawlog size and quality, stand figures compiled by the Forest Survey are generally higher than previous estimates.

Following the check cruising, the task is one of office compilation. The operations involved in this step include: checking and inking the field maps, transferring the types to permanent base maps, summarizing the type areas and volume estimates by townships, and finally summarizing the data by counties and other units desired.

Nonforest Land Types

In classifying nonforest land the following types have been recognized by the Survey:

(1) Barrens - including areas too rocky, too scanty as to soil, or too exposed to support a vegetative cover of either trees, shrubs, or herbs.

(2) Grass - including areas such as parks, mountain meadows, or treeless ridges whose principal vegetation is grass and herbs.

(3) Brush - including areas whose principal vegetation is sagebrush, brush, or shrubs. This is a permanent brush type not to be confused with areas of brush resulting from burns, cutting, or other unnatural causes.

(4) Cultivated - areas cleared or cultivated for agricultural uses, including pasture.

(5) Stump pasture - logged off or burned off areas, part of operating farm units, now chiefly devoted to grazing and from which stumps or snags have not been removed. Usually some attempt has been made to propagate forage plants by seeding or repeated burning.

(6) Town sites - including both incorporated and unincorporated urban settlements.

Forest Land Types

The term "forest land" has been used by the Survey to include all areas chiefly valuable for tree growth. It excludes lands cleared or being cleared for agricultural purposes, and areas within municipalities. It is divided into two large classes: (1) timberlands, including areas capable of producing trees of commercial species and quality; and (2) woodlands, including rocky noncommercial areas, juniper, and subalpine stands, all chiefly valuable for watershed protection. Timberland is further subdivided into the portion producing trees and the smaller percentage that is deforested.

Producing Timberland

Eleven timber types listed in the adjoining chart are recognized in the category of producing timberlands. The classification of timber type is more or less related to the economic worth of the various species within the individual stand. For instance, a timber stand is typed as "white pine" if it contains 15 percent or more white pine by volume in the mature stand, or potentially that much in the immature stand. On the other hand, lacking 15 percent white pine, there must be 75 percent of larch and Douglas fir combined or 50 percent of hemlock and white fir combined to classify a stand in either of those types. The percentages of key species necessary for each of the commercial types are shown in the chart. Ponderosa pine stands are split into two groups to distinguish between the characteristically "pure" and "mixed" stands.

COMMERCIAL TIMBER TYPES

Type		Size Classes	Percents of Species
Western white pine	1	Sawlog	15 percent or more white pine by volume
	2	Pole	
	3	Seedling and sapling	
Ponderosa pine (pure)	1	Sawlog	80 percent or more ponderosa pine by volume
	2	Pole	
	3	Seedling and sapling	
Ponderosa pine (mixed)	1	Sawlog	25 percent or more ponderosa pine by volume
	2	Pole	
	3	Seedling and sapling	
Larch-Douglas fir	1	Sawlog	75 percent or more larch and Douglas fir by volume - 10 percent larch (less than 15 percent W.P. or 25 percent P.P.)
	2	Pole	
	3	Seedling and sapling	
Hemlock-white fir	1	Sawlog	50 percent or more hemlock and white fir by volume (less than 15 percent white pine)
	2	Pole	
	3	Seedling and sapling	
Douglas fir	1	Sawlog	60 percent or more Douglas fir by volume (less than 15 percent white pine or 25 percent ponderosa pine)
	2	Pole	
	3	Seedling and sapling	
Engelmann spruce	1	Sawlog	50 percent or more Engelmann spruce by volume (less than 15 percent white pine)
	2	Pole	
	3	Seedling and sapling	
Lodgepole pine	1	Sawlog	50 percent or more lodgepole pine by volume (less than 15 percent white pine or 25 percent ponderosa pine)
	2	Pole	
	3	Seedling and sapling	
Western red cedar	1	Sawlog	Cedar predominates)
	2	Merchantable pole	Less than 8 cedar poles to acre) Less than
	3	Pole, seedling and sapling	More than 8 cedar poles to acre) 15% white pine
Cedar-white fir	1	Sawlog	Cedar predominates)
	2	Merchantable Pole	Cedar-white fir predominates)
	3	Pole	Less than 8 cedar poles to acre) Less than
	4	Seedling and sapling	More than 8 cedar poles to acre) 15% white pine
Cottonwood	1	Sawlog	Cedar-white fir predominates)
	2	Pole, seedling and sapling	Cedar-white fir predominates)

Size Classes

With the exception of cedar, tree size is divided into three general classes: sawlog, pole, and seedling and sapling. In cedar, a fourth division is made between sawlog and pole to accommodate merchantable cedar poles and piling. The diameter limits for these size classes vary with the species. The minimum sawlog size for white pine, ponderosa pine, and lodgepole pine is 12 inches, diameter breast high. Cedar trees over 24 inches are tallied as sawlog trees and from 12 to 24 inches as merchantable poles. For the other timber species the lower limit to the sawlog class is 14 inches. For all species, trees 6 inches to merchantable size are listed as poles, and those under 6 inches as seedlings and saplings.

Timber types are likewise classified into these size classes (see chart) according to the predominant size of the trees within the individual stands. Lodgepole pine and ponderosa pine stands with three thousand or more board feet to the acre are typed as sawlog. For the other types, excepting cottonwood, which has no volume minimum, stands over four thousand are typed as sawlog. Eight or more cedar poles to the acre, in the absence of sufficient white pine or ponderosa pine volume, serve to classify an area as cedar or cedar-white fir merchantable poles. Stands not meeting the necessary minima of volume or merchantable poles are placed in the younger class that predominates. The term "immature stand"

is used, in these reports, in combining the pole and seedling and sapling stands. It does not indicate the degree of maturity from a silvicultural standpoint.

Deforested Types

Considered as definitely deforested and fated to remain so for a considerable period in the future are the areas classified as nonrestocked old burns and nonrestocked old cutovers. These designations include areas burned or cut and burned prior to 1925 which have failed to restock satisfactorily.

Restocking Types

Considered as producing timberland, but in reality apart in a class by themselves, are the recently cut and recently burned types (since 1925). Herein are lands lately denuded and not as yet restocked nor yet definitely of the "nonrestocked" types. These types also include areas of recent burn or cut, bearing stands which are still in that aftermath period when it is impossible to clearly define the extent of the damage or to determine the final character of the stand. All recently cut or burned lands, which can be so handled, are placed in one of the more permanent producing types.

Woodland Types

That portion of the forest land neither immediately or potentially productive of commercial timber is catalogued into three so-called woodland types. These are: (1) sub-alpine, which includes all forest growth above the altitude

limit of merchantability, (2) rocky noncommercial, including all areas unable to produce merchantable timber by virtue of excessive rockiness, steepness of slope, or sterility of soil, and (3) juniper, embracing stands with 80 percent or more of Rocky Mountain red cedar.

Zones

The Forest Survey has classified all forest area into three zones on the basis of productivity and economic availability. The definitions of these zones are in line with the interpretations adopted by the Forest Service in this region.

Zone 1 is the area of best productivity and accessibility. It includes areas bearing timber of such character, species, and location as could be profitably logged under conditions that have prevailed in the past, assuming a progressive development of transportation facilities. It naturally includes most areas already cut over. All immature stands are projected to maturity and considered in the light of values up to the present in determining the merchantability zone.

Zone 2 is the area of less productivity and accessibility between Zone 1 and Zone 3. It is the area that can be logged only under more favorable conditions of values and demand than have existed in the past. It is really delimited by the boundaries of Zone 1 or Zone 3, or both.

Zone 3 is the area of no probable value for commercial timber production. It includes subalpine, steep rocky

slopes, poor scrubby stands, and better stands in areas of such inaccessibility that it does not seem reasonable to expect that they can be logged in the future.

There are naturally small areas of Zones 2 and 3 within the areas designated as Zone 1, and small areas of Zone 1 within Zone 2, which are not mapped as such. This is a necessary generalization due to the extensive nature of the timber type information.

Ownership

Forest land has been segregated in eight principal proprietorship classes, namely: Large private, small private, state, county, Indian (tribal and trust allotments), national forest, public domain, and other federal lands. No absolute dividing line has been drawn between large and small private owners. A large private owner is defined as any individual or concern owning one thousand acres or more in relatively large blocks. However, intent of ownership and several other factors have been given consideration in selecting those owners to be classed as "large private." The division "other federal lands" is comprised of national parks, military reservations, federal power reservations, and such.

Publicly owned areas are divided into the portions reserved and not reserved from the standpoint of availability for timber conversion. The reserved lands include national parks, national monuments, state parks, military reservations, natural areas, primitive areas, and municipally owned watersheds.

Timber Volumes

In mapping and check cruising sawlog stands the standards set up for tree size and quality are generally lower than for commercial cruising. The specifications adopted by the Survey are as follows:

Species	:Minimum :diameter: :(breast : high)	: Minimum :number of : 16-foot : logs	: Minimum : top : diameter:	: Allowable : percent : defect : per tree
	: <u>Inches</u>	: <u>Number</u>	: <u>Inches</u>	: <u>Percent</u>
White pine	: 12	: 2	: 6	: 67
Ponderosa pine	: 12	: 1	: 8	: 50
Lodgepole pine	: 12	: 1	: 6	: 50
All other species except cedar	: 14	: 2	: 8	: 50

Cedar trees meeting the rigid quality specifications of commercial practice, and which will make a 25-foot or longer pole with a 6-inch or larger top, are tallied as cedar poles. Twelve to 24-inch cedar trees are ordinarily tallied as poles and 24-inch and over as sawlogs. The top diameters in the above table are merely minima, the limits being determined actually on the basis of utilization.

In addition to the timber volume in sawlog stands there is a minor volume contained in trees of sawlog size scattered through immature stands, residual or "remnant" trees left after logging or previous fire. While of no particular value from the standpoint of sawlog production, these trees represent the source of an appreciable volume

of cordwood, fence posts, and certain other minor timber products. Beyond that, they play a most important part in stand reestablishment. To obtain a record of this remnant volume, the Forest Survey has typed all merchantable volume as low as one-half thousand board feet per acre. However, not all of the volume left after logging is included in the latter class. Logged areas with a sufficient stand left to exceed the necessary minima of 3 or 4 thousand board feet to the acre (see discussion of size classes) are classed with uncut stands as sawlog areas.

Stocking

The measurement of the openness or density of the stands, that is, the extent to which the areas are covered with tree growth, is termed the degree of stocking. Stocking is expressed in three general classes: well, medium, or poor. In the case of sawlog stands the measure of degree is determined by the stand volume. For all types, except ponderosa pine and lodgepole pine, stands with 4 to 10 thousand board feet to the acre are considered poorly stocked; 10 to 20 thousand, medium stocked; and 20 thousand board feet and more, well stocked. For ponderosa pine and lodgepole pine, the class limits are 3 to 7 thousand, 7 to 13 thousand, and 13 thousand plus. Areas with less than 3 or 4 thousand board feet to the acre are typed as immature or one of the restocking or deforested types.

In immature stands stocking is the measure of the number and scatter of trees determined by sample plots. Where less than 10 percent of the area is utilized, as measured by stocking quadrats, it is considered unstocked; from 10 to 40 percent, poorly stocked; from 40 to 70 percent, medium stocked; and from 70 to 100 percent, well stocked.

Site

Forest land like farm land has a wide range of producing capacities related to soil quality, rainfall, aspect, and a number of other physical or site factors. A reliable index of the producing capacity or site quality is obtained in the measurement of the height over the age, there being a close relationship between the height of dominant trees at any given age and the site index. The observed range of quality is divided into five or six equal divisions numbered I, II, III, etc., beginning with the best. Where five site classes are used, the transcribed meanings are usually interpreted to be excellent, good, fair, poor, and very poor.

